Capstone Phase III (Statewide)

Alaskan Region • Accelerated NAS Transition • FY06 to FY09

GOAL: This program element will reduce dependency on and thereby enable decommissioning the traditional ground based system of VORs and NDBs to begin in Alaska by FY09.

BACKGROUND: FAA's Flight (Strategic) Plan calls for Capstone technologies and capabilities to expand in three Phases. The first phase, involving ADS-B & related technologies as fielded in the Yukon / Kuskokwim Delta is nearing completion. The second, involving WAAS & WAAS supported capabilities in Southeast Alaska is well underway. The third involves statewide deployment of technologies / capabilities / services developed in earlier phases. Earlier this year Capstone's Industry Council reaffirmed this approach to further Capstone's safety efforts.

Nationally, FAA is struggling to continue operations with a decaying "legacy" NAS while long awaited safety and efficiency gains from modern technologies remain "just out of reach" for both FAA and industry. Attempts to transition to new / emerging technology have focused primarily on FAA's funding stream and business case without full and concurrent consideration given to the operator's circumstances.

Examples include FAA's investment in developing and fielding the Microwave Landing System (MLS) which was later abandoned when operators failed to equip due to the high cost of airborne MLS equipment. In addition to high cost, operators noted they derived little benefit from MLS beyond that already available from their previous investment in ILS equipment. A reverse situation occurred when FAA announced the Future Air Navigation System (FANS-1). Although aircraft manufacturers and operators equipped aircraft, FAA failed to field the Air Traffic Systems necessary to work with FANS-1.

A General Accounting Office (GAO) panel report (GAO-05-333SP) published April 2005 provides additional insight on slow progress towards modernization. The report, titled "Experts' Views on Improving the U.S. Air Traffic Control Modernization Program" notes that "…the key cultural factor impeding modernization has been resistance to change. Such resistance is characteristic of FAA personnel at all levels, and management, in the experience of some, is more resistant than employees who may fear new technologies will threaten their jobs." Furthermore, "Panelists suggested that the ATO could facilitate cultural transformation by creating a vision and strategy that would unite stakeholders and by assembling project teams with different skills and interests whose members could forge common organizational interests by working together to solve common technology development problems."

It is important to recognize that no Air Traffic System will function without both FAA and operators working together. In Alaska, cultural issues with modernization have been overcome by FAA, Industry, and the community they serve joining together intent on leveraging safety from new and emerging technology. This led to the first certified end-to-end ADS-B system, providing electronic surveillance and "radar-like" service by controllers at Anchorage Center beginning 2001. Similarly, WAAS technology was fielded in Alaska as an end-to-end system in 2003.

STATUS: With large areas of the Alaskan NAS already operating with new technologies, benefits derived from WAAS and ADS-B technologies are no longer considered projections but are carefully quantified assessments with results published by the University of Alaska and the Mitre Corporation. While many "technology" lessons have been learned and documented, safety benefits including a 40% reduction in accidents is consistently observed.

Currently, funding for Capstone Phase III (Alaska Statewide) is anticipated to complete a public WAAS / RNP route system and provide electronic surveillance ("radar-like" service) to the Minimum IFR Enroute Altitude for existing airways. However, as none of this brings aircraft into the system, it does not free FAA from the requirement to continue support of legacy systems.

TRANSITION STRATEGIES: Traditionally, FAA fields a capability such as ADS-B and WAAS and continues to support legacy systems until sufficient user equipage levels occur to enable decommissioning. However, maintaining multiple systems is expensive and it serves to slow operator transition. After the MLS and FANS-1 experience, operators are understandably hesitant to invest in anything where FAA appears to maintain a "retreat path" in lieu of an identifiable and clear "exit strategy" to include decommissioning legacy systems.

Alternatively, mandates have served well in safety matters (FAR 135 to 121 transition, TAWS, etc.), but are generally not acceptable in efficiency and business matters.

A third (and preferred) transition path includes an end-to-end strategy that considers business cases for government and operator alike with a definitive timeline. Safety benefits, while real, are intangible, in that beyond insurance, most costs (litigation, lost productivity, etc.) cannot be budgeted for, even though over time safety impact is felt throughout the community.

Each ten years that decommissioning can be moved up saves the government over $111.9M in direct operation and maintenance costs. Providing operators with equipage incentives tied to this savings enables an "exit strategy" which includes an identifiable start date for decommissioning. Such an approach enables FAA to stop investing in the past and enables near term return on monies already invested in new technologies such as WAAS and ADS-B.

OTHER IMPACTS:

- Current technical issues include increased magnetic variation shift rate placing all NDBs in Alaska out of tolerance and generating a requirement for additional flight checking and re-charting routes and approaches. These costs and environmental impacts can be avoided by transitioning away from NDB reliance.

- The Department of Interior's Fish and Wildlife Service identified environmental issues wherein installed legacy NAS facilities impact (by collision with antenna array) migratory waterfowl, including endangered species. In a letter dated September 2, 2004, the Fish and Wildlife service advises "Take of migratory birds (particularly black brant and emperor geese) by the H-antenna NDB violates the Migratory Bird Treaty Act." This impact could be avoided by transitioning away from NDB reliance.

BUSINESS CASE: It's clear that FAA can no longer afford not to modernize its infrastructure and must urge industry to do the same.

Within Alaska (fully 20% of the National Airspace System) infrastructure is sparse compared to the 48 contiguous states. But even in Alaska, the poorest state in terms of aviation facilities, direct FAA costs to maintain and operate the such facilities (VOR's, NDB's, Radars) exceeds $18.7 million each year.

By transitioning away from ground based systems over several years, not several decades, Capstone can demonstrate a cost saving solution to FAA. Providing an incentive to stimulate aircraft transition brings an early dawn on modernization and a clear exit strategy for legacy systems.

The cost to transition an aircraft from its existing investment in legacy systems (VOR, NDB, & Radar) to ADS-B and WAAS capability will vary by aircraft type. Aircraft operating commercially under IFR will incur cost greater than an aircraft operating privately or commercially under VFR. Aircraft operating privately under FAR 91 that do not operate IFR incur the least cost. Yet the cost to transition each category of aircraft is a significant economic impact, which must be addressed to insure a successful transition.

A program to partially reimburse aircraft re-equipage will be implemented over a four year transition period. This will involve a one-time opportunity to upgrade to aircraft equipment compatible with the next generation NAS in Alaska. Cost of incentives is estimated at $100M, or $25.0M/year for FY06 through FY09.

At the end of FY08, a decommissioning program for legacy facilities would begin, with prioritization based on existing need, leading to near term decommissioning of most (non-relevant) NDBs and VORs. Approximately 5 NDBs would be retained to ensure availability of TWEB capability in remote areas, while a skeletal network of VOR capability would remain as a navigation backup and to ensure continued capability for aircraft not WAAS capable (foreign, military, etc.).

ELEMENTS FOR ACCELERATED NAS TRANSITION:

1) Already begun in FY05 and continuing through FY06, existing VHF routes ("Victor" airways) will be overlaid with charted WAAS enabled RNAV (variously called "Q" or "T" routes). Similarly, stand alone LF routes ("Colored" airways) will also be overlaid with charted WAAS enabled RNAV or "Q" routes. This element is currently funded.

2) During FY05, 12 GBTs are being fielded. Twelve (12) additional GBTs will be fielded during each of the next three fiscal years, expanding ADS-B coverage in statewide by up to 60 additional GBTs. This will provide electronic surveillance capability for Air Traffic to the minimum altitudes of low level airways in Alaska. This element is currently funded.

3) Beginning in FY05, the program office will by survey, validate existing aircraft numbers and type use within Alaska. This element is funded and underway.

4) Beginning FY06, and each year through FY09, Capstone would provide incentives in the form of partial reimbursements (up to 90% within an identified price cap) for operator installed WAAS and ADS-B capability, based on type of aircraft/operations, up to $25.0M per year. This buy out of previous operator' investment in legacy systems enables an accelerated transition to the future NAS. This element is currently unfunded.

5) Beginning FY08, FAA begins a first level of decommissioning with low impact facilities (VOR, NDB, and radars) not required in support of backup navigation, high altitude ("J" or Jet) airways or international operations.

This final element is the first step towards an end state in which the NAS radio navigation infrastructure will leverage advanced avionics and satellite navigation capabilities to provide universal RNAV services with vertically guided instrument approach services and "radar-like" ATC services while reducing the cost of the ground based infrastructure. Details of navaid divestments are currently being defined. A few existing NDB facilities will be retained to ensure availability of TWEB service in remote areas. Surveillance capability will leverage advanced avionics and limited ground based infrastructure to permit surveillance over much of Alaska for the first time ever. It should be noted however, that increased surveillance does not mean more traffic controllers – it simply means better air traffic control and smoother air traffic flow by reducing manual air traffic procedures.

REQUIREMENT: This goal requires $100.0M additional support, $25.0M each year beginning FY06 and continuing through FY08. Unlike government owned facilities & equipment, this becomes a one time investment without a residual "ops-tail" funding requirement.

ISSUES: Prioritization for decommissioning will need to consider international harmonization and trade laws, along with strategies for military aircraft transition. Operating issues include determining extent of back-up capability required. In Alaska, this has rarely been an issue as back-up capability including availability of radar is sparse and often non-existent. This is an issue, however in the 48 contiguous states where such capability is the norm. Human factors including training and acceptance must also be worked through.

BENEFITS:

- Cost savings are realized by divesting in ground based infrastructure and replacing it with technology that is less expensive to install and maintain.

- Surveillance in non-radar airspace increases safety and results in more efficient traffic flow.

- Required Navigation Performance (RNP) is supported by numerous technologies including ground and satellite based. One of the technologies supporting RNP is Distance Measuring Equipment (DME). A consideration for DME/DME supported RNP involves ensuring routes / procedures are within the service volume limits of multiple DME facilities. GPS / WAAS enabled RNP is not so constrained and allows route design free of DME limitation.

- Weather and traffic information supplied to the flight deck improves situational awareness, without adding additional air traffic controllers or flight service specialists.

- Enables modeling and safety analysis with new NAS technologies

- Migrates towards “self-enabled” Flight Operations in selected airspace

- This initiative continues to demonstrate international leadership. The April 2005 GAO panel report suggested “…the ATO could consult an advisory board, identify and consider purchasing needed technologies that other countries have developed, and hire more skilled engineers to provide in-house expertise.” The United States has already demonstrated capability with ADS-B and WAAS to foreign countries who, in many cases, have adopted the standards already fielded in Alaska.